infected cuts and the control cuts. After a week or more the bark around the infected cuts turned brown and black; it gradually dried and became more or less depressed. The branches inoculated with *Glœosporium* spores from apples showed unmistakable signs of canker formation about four or five weeks after the inoculation. Small black acervuli were noticeable about the edges of the shriveled bark, which were found to be true *Glœosporium* pycnidia. Inoculations were thereupon made with spores from these cankers, into apples, and these showed the characteristic bitter rot disease a week later.

The branches inoculated with *Glœosporium* spores from pure cultures (made from cankers taken from orchards) showed the formation of exceedingly striking cankers by the beginning of September. These cankers had numerous pycnidia with mature spores, which, when inoculated into apples, produced the characteristic bitter rot disease with pycnidia. One must add that, with the very large number of inoculations made, not a single control cut or puncture showed any signs of disease.

The cycle of infections made may be recapitulated briefly, as follows:

1. Spores of *Glœosporium fructigenum* from apples affected with the bitter rot disease, inoculated into living apple branches produced an apple canker with *Glœosporium fructigenum* spores, and the latter inoculated into healthy apples produced the bitter rot disease.

2. Pure cultures of *Glœosporium fructigenum* were obtained from apple cankers in the orchard. The spores from such pure cultures, when inoculated into living apple branches, gave rise to apple cankers with pycnidia and spores of *Glœosporium fructigenum*. These spores, inoculated into apples, produced the bitter rot disease.

It appears from these preliminary studies, that there is a causal relation between apple cankers found in numerous orchards and the bitter rot disease, and that it is very probable that this fungus is capable of living both in the bark and the fruit of the apple. This fact will be an important one in assisting apple growers to combat the disease.

The details of the cultures and the observations, together with illustrations, and a discussion as to the relationship of the various stages of this fungus and its host, are to be published in full before long.

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THE TERTIARY OF THE SABINE RIVER.

The results of Dr. Veatch's work in the Tertiary deposits along the Sabine River, as published in the 'Report of the Louisiana Geological Survey,' 1902, are of great value in clearing up the stratigraphy of that region and in showing the presence of deposits of Jackson age in the Eocene of Texas, where they had not been recognized with certainty by earlier observers.

In his correlation of these deposits with the general Texas section, on page 141, he uses Kennedy's table. In this the reference of certain east Texas materials to the Fayette and Frio beds was made entirely on account of lithological similarity and supposed stratigraphic equivalency, but subsequent work has shown that they do not belong to those horizons, but to others of much later date.

In Texas, the area occupied by the outcrop of deposits of Lower Claiborne is so immense that it has been found convenient to break it up into four substages: The Marine, Yegua, Fayette and Frio. These four substages outcrop for more than thirty miles on the Brazos river and for no less than one hundred and thirty miles on the Rio Grande. They are all fossiliferous, and the great number of fossils collected from the first three, and determined by Professor Harris, proves their Lower Claiborne age conclusively. Professor Harris also placed the Frio clays in the same stage on the basis of such fossils as we obtained in it, and we so hold it.

These beds are usually overlain directly by Neocene deposits.

Loughridge, in his report on Cotton Production in Texas (Tenth Census Report), gave a brief description of the Miocene beds as then known, and outlined the northern

boundary very correctly. In fact it is more nearly correct than some of the later ones. The beds which he refers to this period had been previously noted by Shumard, Buckley and others, and their age determined to some extent by vertebrate remains found in their upper portion. In 1894 I described these beds * as they occur in southwest Texas and, on the basis of Professor Cope's determinations, separated the Neocene into Oakville (Miocene), Lapara, Legarto and Reynosa (Pliocene). Later I traced these beds to east Texas and proved their identity with Loughridge's beds,† and thus found that the clays and sands east of the Trinity, which Kennedy has called the Fayette and Frio, are in fact Oakville and Lapara-Lagarto. The only exception to this which I now recall is the sandstone north of Corrigan, which Professor Harris first thought was Lower Claiborne, but after study of fuller collections decided to be Jackson.

Therefore the true correlation of the two sections would probably be more like this:

Texas Section.			Sabine Section.
Lapara-Lagarto, Oakville ?		Neocene.	Burkville beds.
Oakville.			Grand Gulf.
Lower Claiborne.	Frio.	Eocene.	Jackson.
	Fayette.		Wanting.
	Yegua.		Wanting.
	Marine.		Cooksfield Ferry.
			Lower Claiborne.
			Wanting as such.
			Basal Lignitic.
Lignitic.	Carrizo Sands (Queen City).		
	Lignitic.		

My interpretation would be that the Sabine section shows an overlap of the Lower Claiborne on the Lignitic, entirely covering the sandy, unfossiliferous Carrizo beds, which elsewhere in Texas form so prominent a feature at the top of the Lignitic beds. Also an overlap of the Jackson on the Yegua ? (Cooksfield Ferry beds), covering both the Fayette and the Frio.

* *Journal of Geology*, Vol. II., pp. 549, etc.

† *Trans. Tex. Ac. Sc.*, 1894, pp. 23. *Trans. Am. Inst. Min. Eng.*, Vol. XXXI.

The Oakville is stratigraphically the correlative of the Grand Gulf, and it is possible that closer work in Texas may yet show that the lower portion, in which we have found no fossils as yet, is the extension of the Oligocene portion of the formation. From Harris' determination of the age of the Burkeville beds, I suspect them to be a part of the Oakville beds, as they are certainly older than any Lapara we know west of the Trinity. It will require still further field work, however, to determine its exact relation to these beds.

E. T. DUMBLE.

A NOTE ON METHODS OF ISOLATING COLON BACILLI.

IT often happens that bacteriologists wish to obtain fresh cultures of *Bacillus coli* for experimental purposes and they sometimes find that the methods of isolation in general use are unsuccessful or inconvenient. The reasons for the latter fact have not hitherto, so far as I am aware, been satisfactorily explained. In some comparative bacteriological studies made in cooperation with one of my students, Mr. William J. Mixter, I found it necessary to obtain a large number of fresh cultures of *B. coli* and soon learned that the two methods in common use, viz. (1) 'plating out' the aqueous suspension of fresh fæces in agar, litmus-lactose-agar, or gelatin, or (2) inoculating from such a suspension into dextrose broth and incubating eighteen to twenty-four hours with subsequent plate cultivation, while giving a plentiful supply of bacteria gave, for the most part, negative results as regards *B. coli*.

After considerable experimenting we finally hit upon the following method with satisfactory results. A very small portion of fresh fæces is inoculated directly into dextrose broth in the fermentation tube, and allowed to develop at 37°. At the end of from two to six hours the culture medium becomes turbid throughout and gas formation is generally proceeding rapidly. If inoculation is now made into litmus-lactose-agar plates and incubation continued at blood heat, colonies of *B. coli* develop abundantly and with great rapidity. Isolation, purification and cultural tests can then be carried on by the usual methods,